FIG. 1

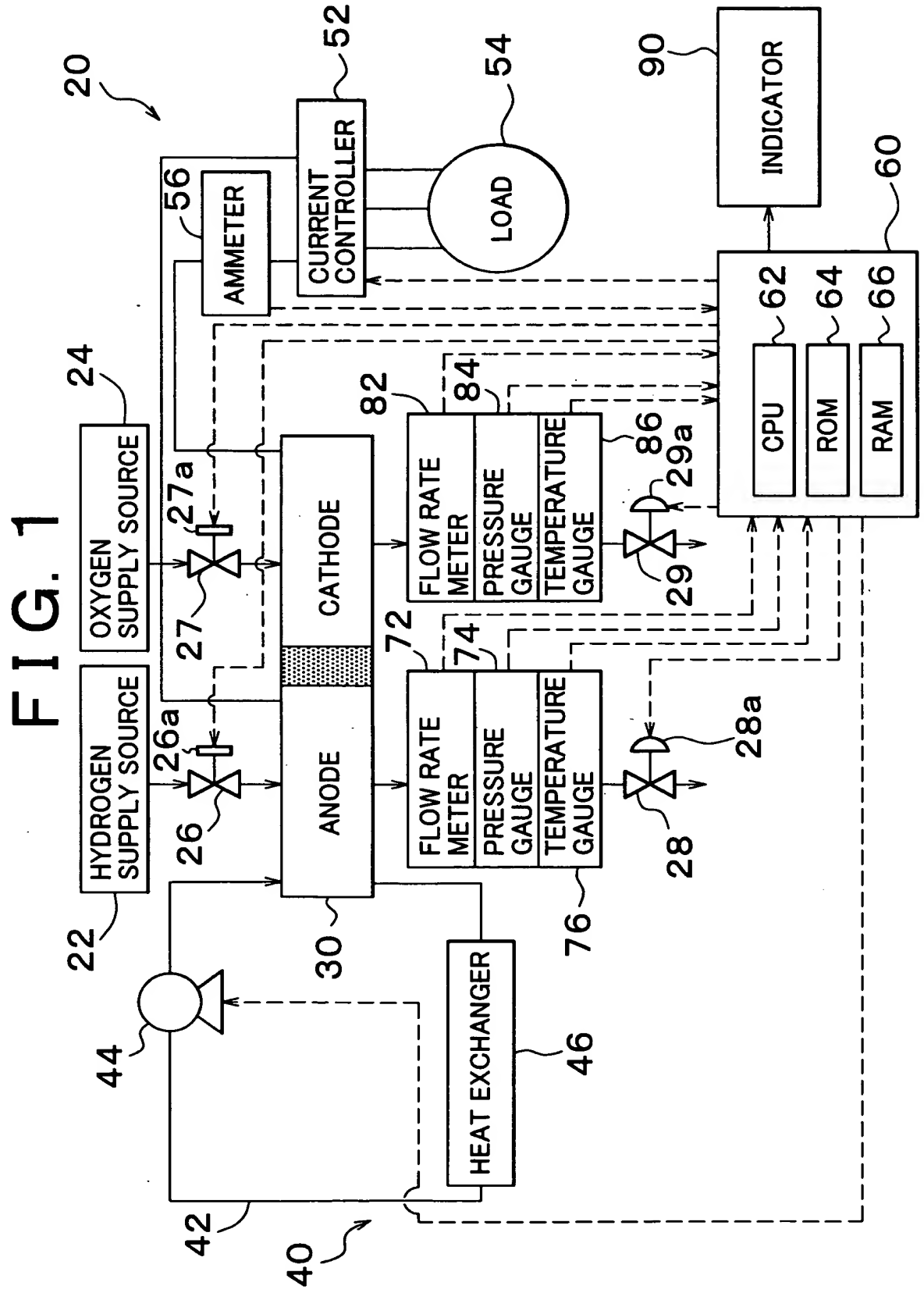

20
52
CURRENT CONTROLLER
54
LOAD
90
INDICATOR
56
AMMETER
60
62
CPU
64
ROM
66
RAM
24
OXYGEN SUPPLY SOURCE
82
84
FLOW RATE METER
PRESSURE GAUGE
TEMPERATURE GAUGE
86
29a
29
27a
27
CATHODE
72
74
FLOW RATE METER
PRESSURE GAUGE
TEMPERATURE GAUGE
28a
28
HYDROGEN SUPPLY SOURCE
26a
26
ANODE
22
30
76
44
HEAT EXCHANGER
46
42
40

FIG. 2

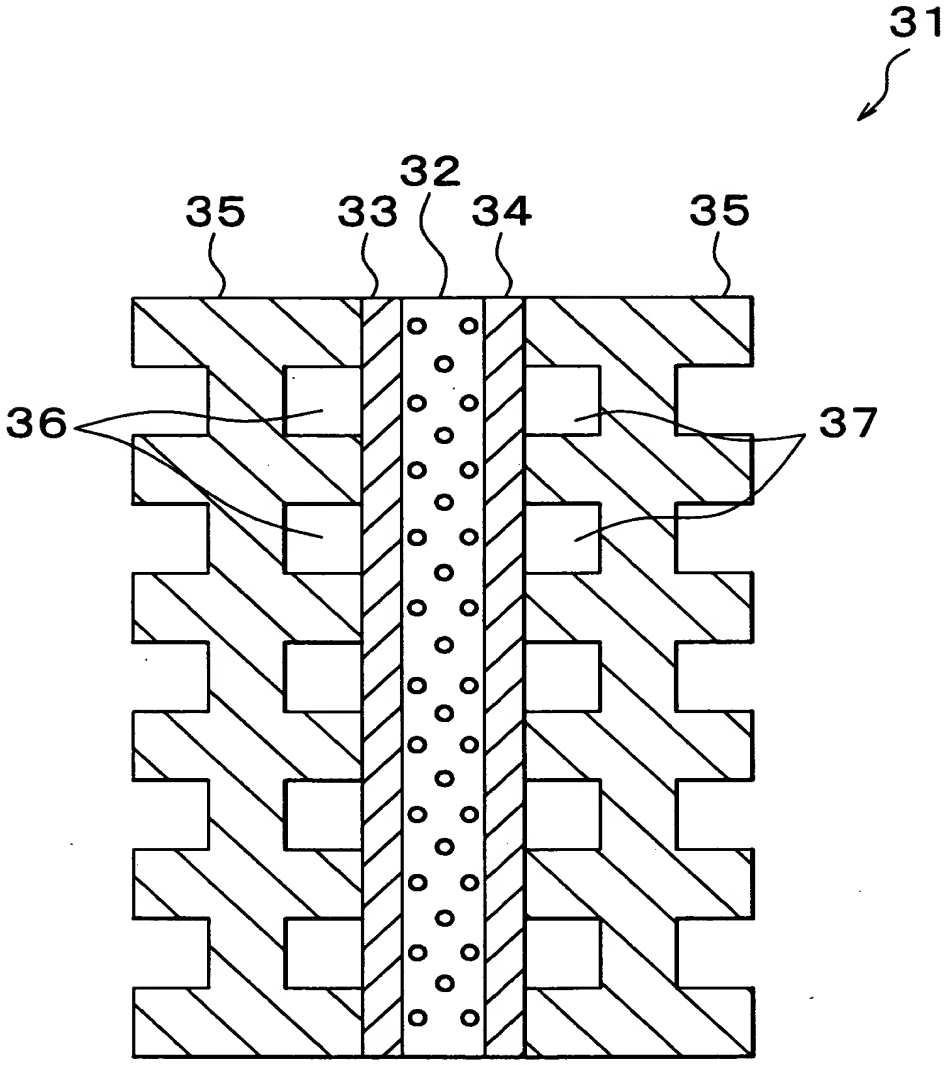


FIG. 3

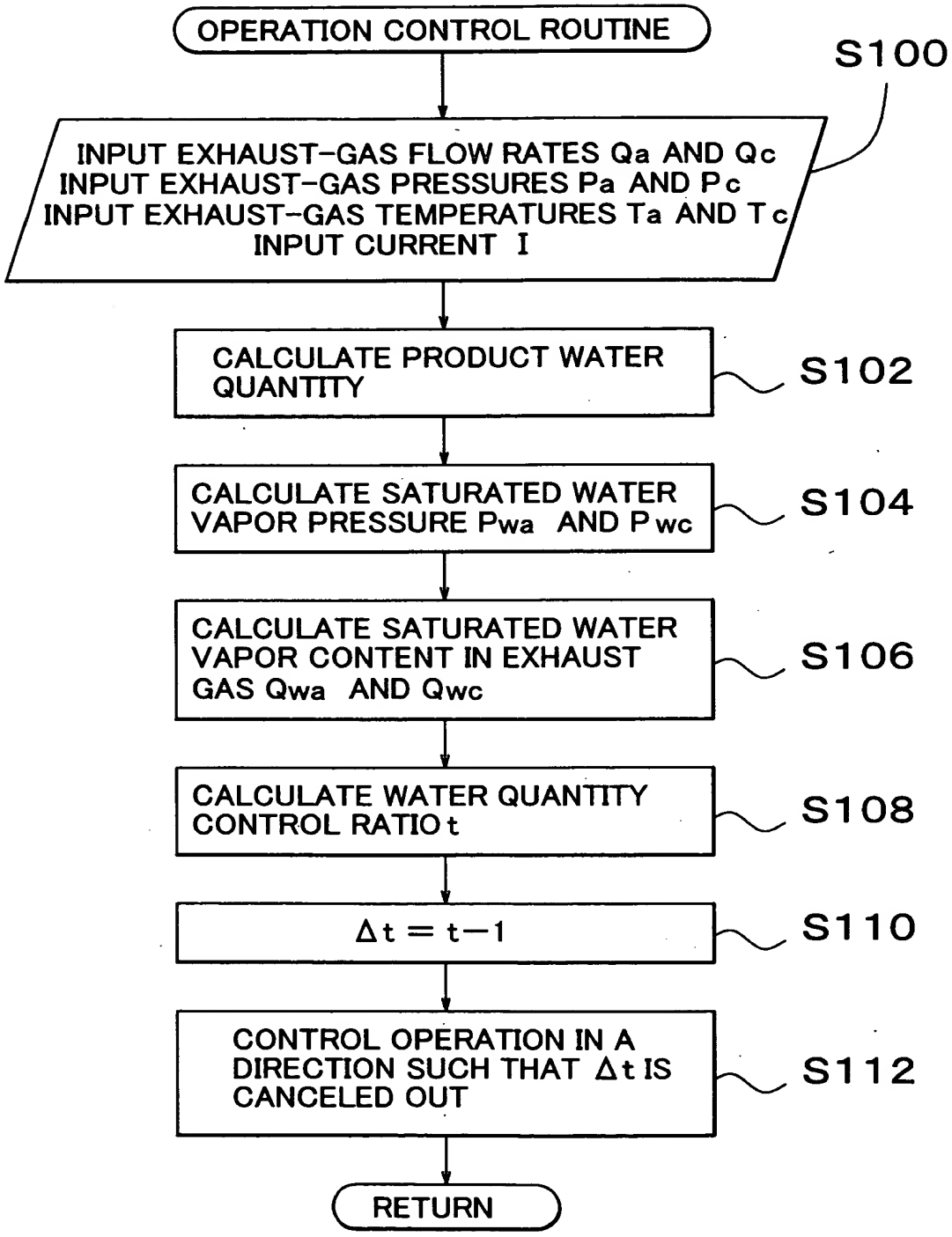

OPERATION CONTROL ROUTINE
S100
INPUT EXHAUST-GAS FLOW RATES Qa AND Qc
INPUT EXHAUST-GAS PRESSURES Pa AND Pc
INPUT EXHAUST-GAS TEMPERATURES Ta AND Tc
INPUT CURRENT I
CALCULATE PRODUCT WATER QUANTITY
S102
CALCULATE SATURATED WATER VAPOR PRESSURE Pwa AND Pwc
S104
CALCULATE SATURATED WATER VAPOR CONTENT IN EXHAUST GAS Qwa AND Qwc
S106
CALCULATE WATER QUANTITY CONTROL RATIO t
S108
Δt = t−1
S110
CONTROL OPERATION IN A DIRECTION SUCH THAT Δt IS CANCELED OUT
S112
RETURN

FIG. 4

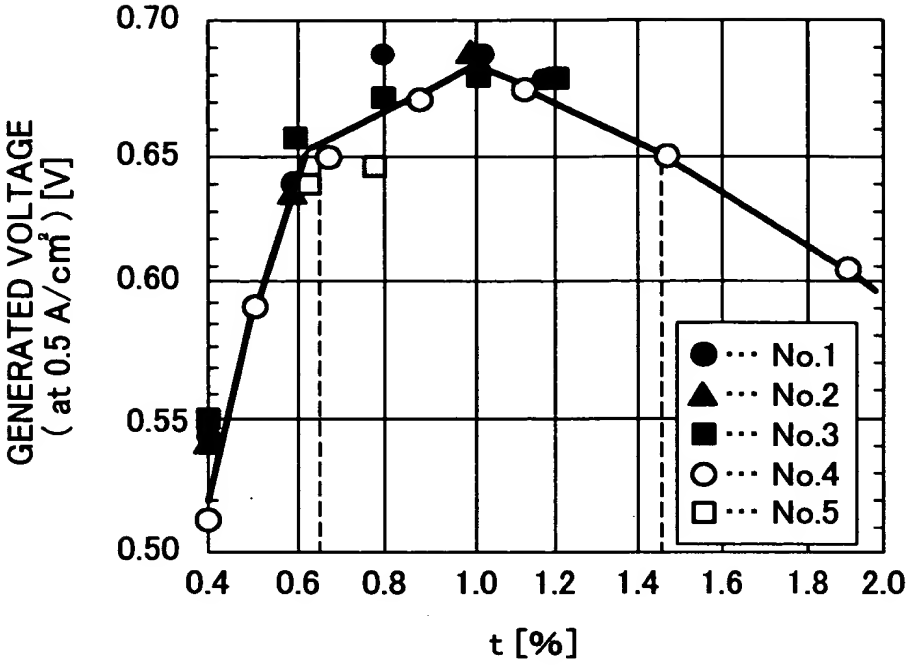

GENERATED VOLTAGE
(at 0.5 A/cm²) [V]
0.70
0.65
0.60
0.55
0.50
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
t [%]
No.1
No.2
No.3
No.4
No.5

FIG. 5

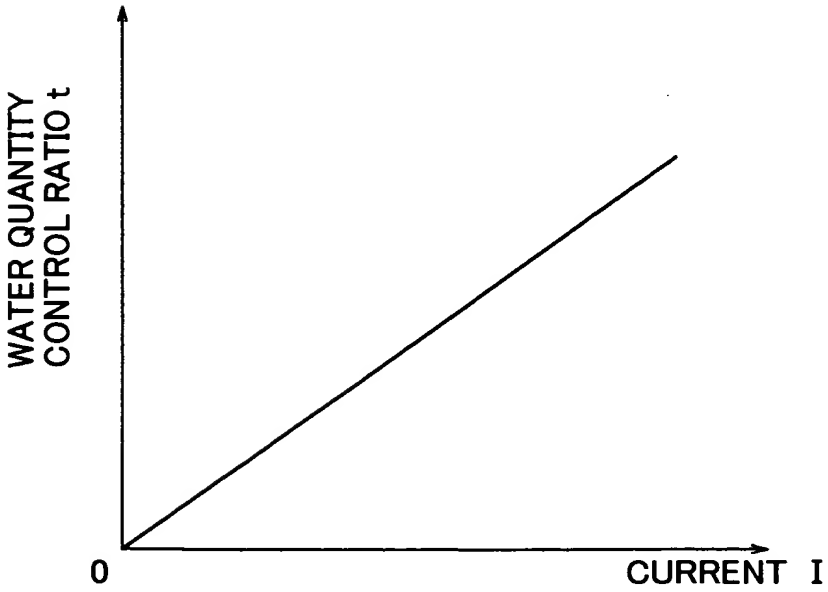

WATER QUANTITY
CONTROL RATIO t
0
CURRENT I

FIG. 6

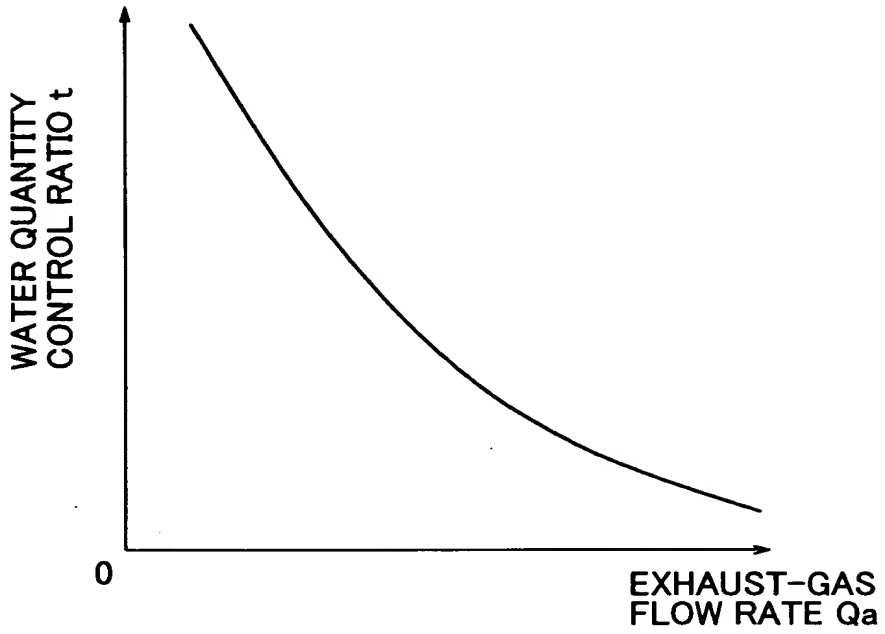

WATER QUANTITY CONTROL RATIO t
0
EXHAUST-GAS FLOW RATE Qa

FIG. 7

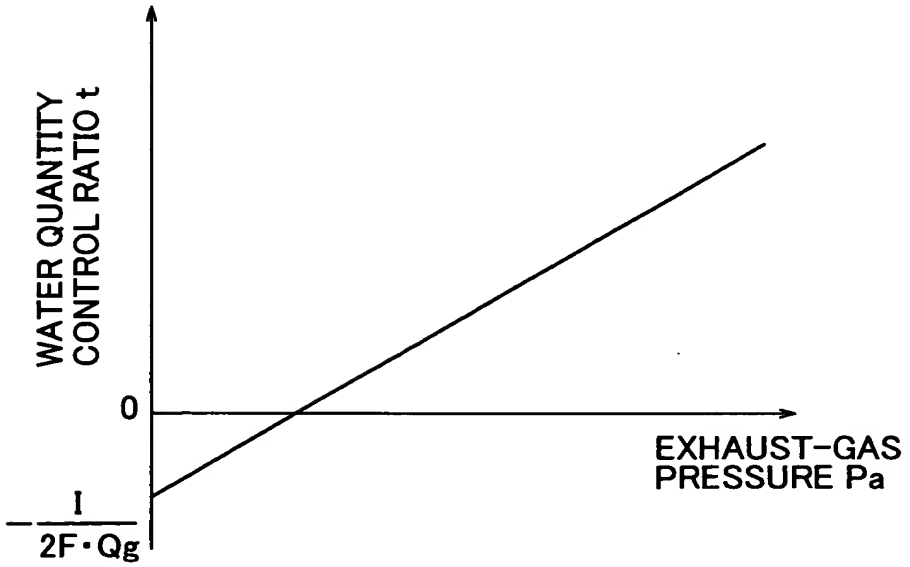

WATER QUANTITY CONTROL RATIO t
0
EXHAUST-GAS PRESSURE Pa
$-\frac{I}{2F \cdot Qg}$

FIG. 8

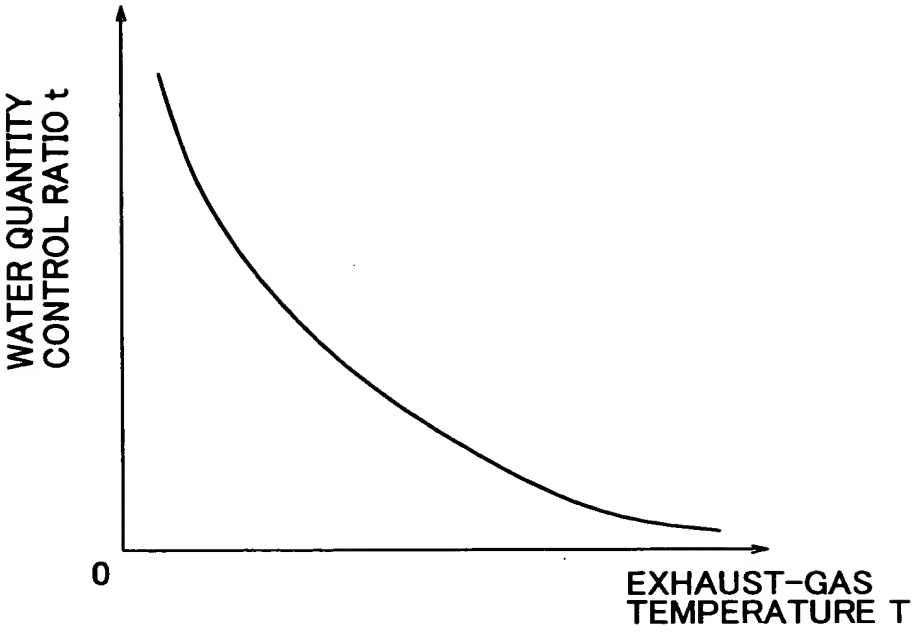

WATER QUANTITY CONTROL RATIO t
0
EXHAUST-GAS TEMPERATURE T

FIG. 9

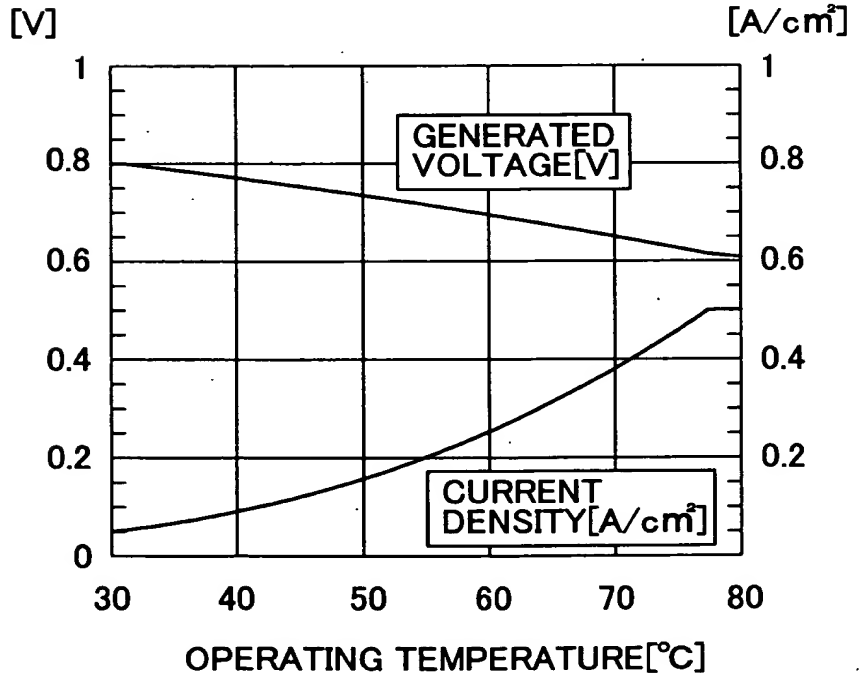

[V]
[A/cm²]
1
0.8
0.6
0.4
0.2
0
GENERATED VOLTAGE[V]
CURRENT DENSITY[A/cm²]
30
40
50
60
70
80
OPERATING TEMPERATURE[°C]

FIG. 10

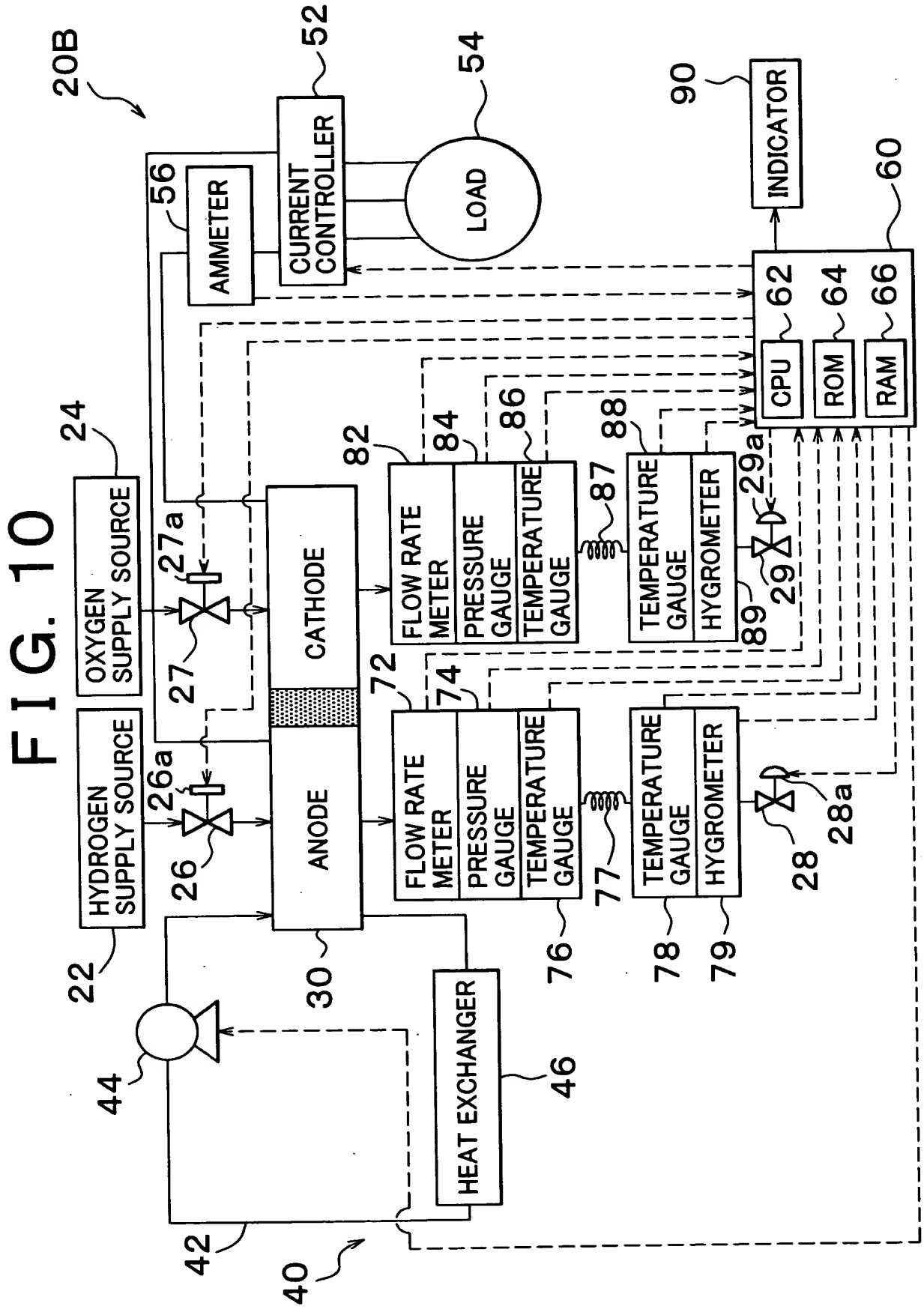

20B
52
CURRENT CONTROLLER
54
LOAD
56
AMMETER
90
INDICATOR
60
62
CPU
64
ROM
66
RAM
24
OXYGEN SUPPLY SOURCE
27a
27
CATHODE
82
84
86
88
FLOW RATE METER
PRESSURE GAUGE
TEMPERATURE GAUGE
87
TEMPERATURE GAUGE
HYGROMETER
29a
29
89
72
74
HYDROGEN SUPPLY SOURCE
26a
26
ANODE
FLOW RATE METER
PRESSURE GAUGE
TEMPERATURE GAUGE
77
TEMPERATURE GAUGE
HYGROMETER
28a
28
22
30
76
78
79
44
HEAT EXCHANGER
46
42
40

FIG. 11

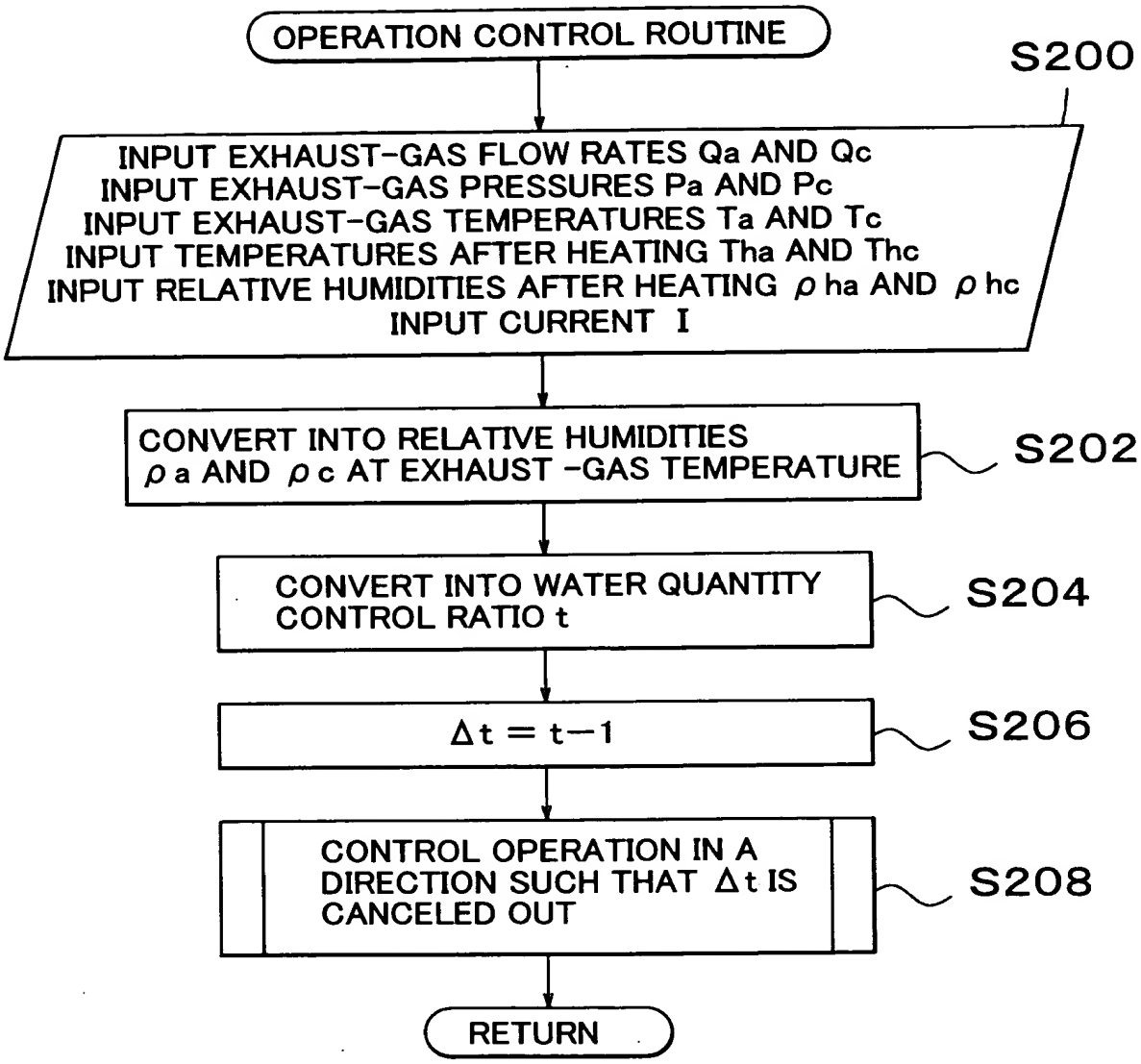
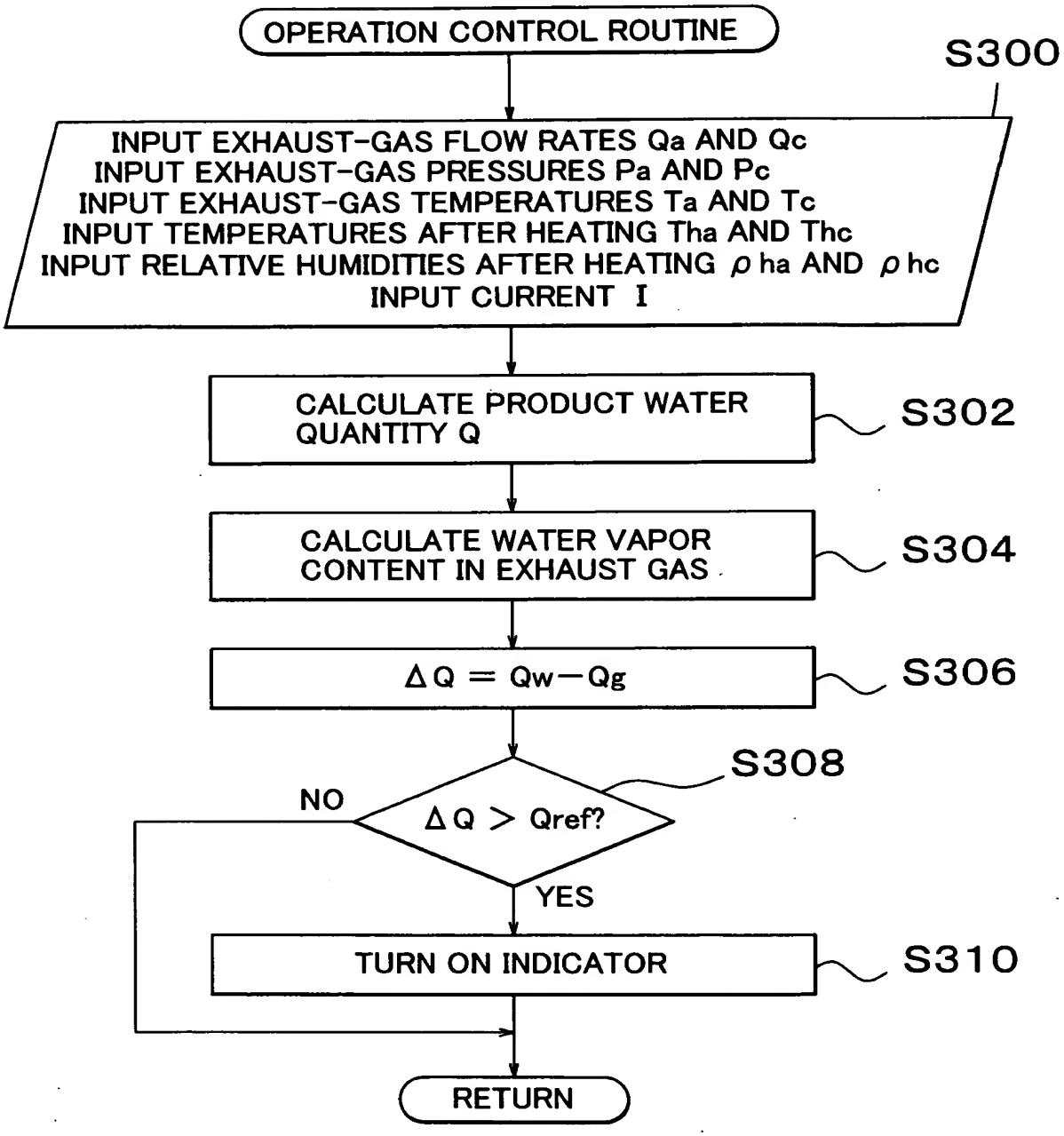

OPERATION CONTROL ROUTINE
S200
INPUT EXHAUST-GAS FLOW RATES Qa AND Qc
INPUT EXHAUST-GAS PRESSURES Pa AND Pc
INPUT EXHAUST-GAS TEMPERATURES Ta AND Tc
INPUT TEMPERATURES AFTER HEATING Tha AND Thc
INPUT RELATIVE HUMIDITIES AFTER HEATING ρha AND ρhc
INPUT CURRENT I
CONVERT INTO RELATIVE HUMIDITIES ρa AND ρc AT EXHAUST -GAS TEMPERATURE
S202
CONVERT INTO WATER QUANTITY CONTROL RATIO t
S204
Δt = t−1
S206
CONTROL OPERATION IN A DIRECTION SUCH THAT Δt IS CANCELED OUT
S208
RETURN

FIG. 12


OPERATION CONTROL ROUTINE
S300
INPUT EXHAUST-GAS FLOW RATES Qa AND Qc
INPUT EXHAUST-GAS PRESSURES Pa AND Pc
INPUT EXHAUST-GAS TEMPERATURES Ta AND Tc
INPUT TEMPERATURES AFTER HEATING Tha AND Thc
INPUT RELATIVE HUMIDITIES AFTER HEATING ρha AND ρhc
INPUT CURRENT I
CALCULATE PRODUCT WATER QUANTITY Q
S302
CALCULATE WATER VAPOR CONTENT IN EXHAUST GAS
S304
ΔQ = Qw−Qg
S306
S308
NO
ΔQ > Qref?
YES
TURN ON INDICATOR
S310
RETURN